

Amendment to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A method of embedding digital watermark information $b_1 - b_n$ ($2 \leq n$) in image data, comprising steps of:

dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

defining a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S;

allocating each of the areas S constituting each area G to some one of: areas $T_1 - T_n$ which said digital watermark information $b_1 - b_n$, a bit value of the digital watermark information being 0 or 1, is respectively embedded and areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded;

locating areas $T_1 - T_n$ and areas $H_1 - H_m$ in a predetermined same arrangement in each area G; and

~~locating one or more areas T and one or more areas H in a predetermined arrangement in each area G; and~~

locating the plurality of areas G in a predetermined rule.

2. (currently amended) A method of embedding digital watermark information $b_1 - b_n$ ($2 \leq n$) in image data, comprising steps of:

dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

defining a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S;

allocating each of the areas S constituting each area G to some one of: areas $T_1 - T_n$ in which said digital watermark information $b_1 - b_n$, a bit value of the digital watermark information being 0 or 1, is respectively embedded, areas $J_1 - J_k$ ($1 \leq k$) in which information $p_1 - p_k$ ($1 \leq k$) specifying an embedding format for embedding said digital watermark information $b_1 - b_n$ in said areas $T_1 - T_n$, and areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded;

locating areas $T_1 - T_n$, areas $J_1 - J_k$ and areas $H_1 - H_m$ in a predetermined same arrangement in each area G; and

~~locating one or more areas T, one or more areas J, one or more areas H in a predetermined arrangement in each area G; and~~

locating the plurality of areas G in a predetermined rule.

3. (original) The method of embedding digital watermark information according to Claim 2, wherein:

said digital watermark information $b_1 - b_n$ is embedded by increasing or decreasing pixel data values in the corresponding areas $T_1 - T_n$ according to a bit value (0, 1) of each bit of the digital watermark information $b_1 - b_n$; and

said information $p_1 - p_k$ specifying said embedding format is embedded such that said information indicates a pattern of respective increasing/decreasing

directions in the area $T_1 - T_n$ for a bit value of the digital watermark information, in each area G to which the areas $J_1 - J_k$ embedded with said information $p_1 - p_k$ belong.

Sub
a

4. (currently amended) The method of embedding digital watermark information according to Claim 1, wherein:

each of said areas G includes a plurality of said areas H that have been allocated $H_1 - H_m$ which have been predetermined in a location so as to be asymmetric in vertical and horizontal directions in the area G in question.

19

5. (currently amended) A method of extracting digital watermark information, for extracting the digital watermark information $b_1 - b_n$ ($2 \leq n$), a bit value of the digital watermark information being 0 or 1, from image data in which said digital watermark information is embedded, comprising steps of:

dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

detecting areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded, from said plurality of areas S ; and

recognizing a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S , said plurality of areas G being located on said image data, and said recognition being carried out ~~based on locations of said detected areas $H_1 - H_m$ ($1 \leq m$) on said image data~~ by comparing locations of said detected areas $H_1 - H_m$ on said image data and locations of predetermined areas $H_1 - H_m$ in the areas S .

6. (currently amended) A method of extracting digital watermark information, for extracting the digital watermark information $b_1 - b_n$ ($2 \leq n$), a bit value of the digital watermark information being 0 or 1, from image data in which said digital watermark information is embedded, comprising steps of:

dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels; detecting areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded, from said plurality of areas S ;

recognizing a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S , said plurality of areas G being located on said image data, and said recognition being carried out by comparing locations of said detected areas $H_1 - H_m$ on said image data and locations of predetermined areas $H_1 - H_m$ in the areas S based on locations of said detected areas $H_1 - H_m$ ($1 \leq m$) on said image data;

in each of the plurality of areas G recognized, extracting information $p_1 - p_k$ ($1 \leq k$) from areas $J_1 - J_k$ in which said information $p_1 - p_k$ ($1 \leq k$) in which said information $p_1 - p_k$ ($1 \leq k$) should be embedded, said information $p_1 - p_k$ specifying an embedding format for embedding said digital watermark information $b_1 - b_n$ respectively in said areas $T_1 - T_n$;

recognizing the embedding format of the digital watermark information $b_1 - b_n$ in the areas $T_1 - T_n$ in the area G in question; and

extracting the digital watermark information $b_1 - b_n$ from the areas $T_1 - T_n$, according to the recognized embedding format.

7. (original) The method of extracting digital watermark Information according to Claim 6, wherein:

for each of the plurality of groups G recognized, the information $p_1 - p_k$ embedded in the areas $J_1 - J_k$ is extracted to recognize a pattern of increasing/decreasing directions of pixel data values for a bit value of the digital watermark information, in the area G in question; and

each bit value of the digital watermark information $b_1 - b_n$ embedded in the areas $T_1 - T_n$ is detected according to the recognized pattern of increasing/decreasing directions.

8. (currently amended) The method of extracting digital watermark information according to Claim 5, wherein a plurality of areas H are detected from each of the areas G;

the detected areas H are compared with ~~an a~~ predetermined location in the areas $H_1 - H_m$, ~~embedding pattern for the areas H, said~~ predetermined location ~~embedding pattern~~ being determined in advance such that the areas H become asymmetric in vertical and horizontal directions in the area G in question; and contents of image processing carried out on the image data are judged.

9. (currently amended) A program product for making a computer execute a method of embedding digital watermark information $b_1 - b_n$ ($2 \leq n$), a bit value of the digital watermark information being 0 or 1, in image data, comprising:

codes for dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

codes for defining a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S;

codes for allocating each of the area S constituting each area G to some one of: areas $T_1 - T_n$ in which said digital watermark information $b_1 - b_n$ is respectively embedded and areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded;

codes for locating one or more areas ~~T and one or more areas H~~ $T_1 - T_N$ and one or more areas $H_1 - H_m$ in a predetermined same arrangement in each area G;

codes for locating the plurality of areas G in a predetermined rule; and
a computer readable storage medium for holding the codes.

10. (currently amended) A program product for making a computer execute a method of embedding digital watermark information $b_1 - b_n$ ($2 \leq n$) in image data, comprising:

codes for dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

codes for defining a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S;

codes for allocating each of the areas S constituting each area G to some one of: areas $T_1 - T_n$ in which said digital watermark information $b_1 - b_n$ is respectively embedded, areas $J_1 - J_k$ ($1 \leq k$) in which information $p_1 - p_k$ ($1 \leq k$) specifying an

embedding format for embedding said digital watermark information $b_1 - b_n$, a bit value of the digital watermark information being 0 or 1, in said areas $T_1 - T_n$, and areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded;

Sub
Q1
codes for locating one or more areas ~~$T_1 - T_n$~~ , ~~one or more areas $J_1 - J_k$~~ , and ~~one or more areas $H_1 - H_m$~~ , and areas $J_1 - J_k$ in a predetermined same arrangement in each area G;

codes for locating the plurality of areas G in a predetermined rule; and
a computer readable storage medium for holding the codes.

19
11. (original) The program product according to Claim 10, further comprising:
codes for embedding said digital watermark information $b_1 - b_n$ by increasing or decreasing pixel data values in the corresponding areas $T_1 - T_n$ according to a bit value (0, 1) of each bit of the digital watermark information $b_1 - b_n$; and

codes for embedding said information $p_1 - p_k$ specifying said embedding format such that said information indicates a pattern of respective increasing/decreasing directions in the areas $T_1 - T_n$ for a bit value of the digital watermark information, in each area G to which the areas $J_1 - J_k$ embedded with said information $p_1 - p_k$ belong.

12. (currently amended) The program product according to Claim 9, wherein:
each of said areas G includes a plurality of said areas ~~$H_1 - H_m$~~ ~~that have been allocated~~ $H_1 - H_m$ which have been predetermined in a location so as to be asymmetric in vertical and horizontal directions in the area G in question.

13. (currently amended) A program product for making a computer execute a method of extracting digital watermark information $b_1 - b_n$ ($2 \leq n$), a bit value of the digital watermark information being 0 or 1, from image data in which said digital watermark information is embedded, comprising:

codes for dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

codes for detecting areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded, from said plurality of areas S;

codes for recognizing a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S, said plurality of areas G being located on said image data, and said recognition being carried out by comparing locations of said detected areas $H_1 - H_m$ on said image data and locations of predetermined areas $H_1 - H_m$ in the areas S based on locations of said detected areas $H_1 - H_m$ ($1 \leq m$) on said image data; and a computer readable storage medium for holding the codes.

14. (currently amended) A program product for making a computer execute a method of extracting digital watermark information $b_1 - b_n$ ($2 \leq n$), a bit value of the digital watermark information being 0 or 1, from image data in which said digital watermark information is embedded, comprising:

codes for dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

codes for detecting areas $H_1 - H_m$ ($2 \leq m$) in which any of bit information 0

and 1 is not embedded, from said plurality of areas S codes for recognizing a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S. said plurality of areas G being located on said image data, and said recognition being carried out by comparing locations of said detected areas $H_1 - H_m$ on said image data and locations of predetermined areas $H_1 - H_m$ in the areas S based on locations of said detected areas $H_1 - H_m$ ($1 \leq m$) on said image data;

codes for extracting, in each of the plurality of areas G recognized, information $p_1 - p_k$ ($1 \leq k$) from areas $J_1 - J_k$ in which said information $p_1 - p_k$ ($1 \leq k$) should be embedded, said information $p_1 - p_k$ specifying an embedding format for embedding said digital watermark information $b_1 - b_n$ respectively in said areas $T_1 - T_n$;

codes for recognizing the embedding format of the digital watermark information $b_1 - b_n$ in the areas $T_1 - T_n$ in the area G in question;

codes for extracting the digital watermark information $b_1 - b_n$ from the areas $T_1 - T_n$, according to the recognized embedding format; and

a computer readable storage medium for holding the codes.

15. (original) The program product according to Claim 14, further comprising: codes for extracting, for each of the plurality of groups G recognized, the information $p_1 - p_k$ embedded in the areas $J_1 - J_k$, to recognize a pattern of increasing/decreasing directions of pixel data values for a bit value of the digital watermark information, in the area G in question, and to detect each bit value of the digital watermark information $b_1 - b_n$ embedded in the areas $T_1 - T_n$ according to the

recognized pattern of increasing/decreasing directions.

61
Sub
C

16. (original) The program product according to Claim 13, further comprising:
codes for detecting a plurality of areas H from each of the areas G;
codes for comparing the detected areas H with an embedding pattern for the areas H, said embedding pattern being determined in advance such that the areas H become asymmetric in vertical and horizontal directions in the area G in question;
and

codes for judging contents of image processing carried out on the image data.

17. (currently amended) An apparatus for embedding digital watermark information $b_1 - b_n$ ($2 \leq n$) in image data, comprising:

a processing part for dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

a processing part for defining a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S;

a processing part for allocating each of the areas S constituting each area G to some one of: areas $T_1 - T_n$ in which said digital watermark information $b_1 - b_n$, a bit value of the digital watermark information being 0 or 1, is respectively embedded and areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded;

a processing part for locating one or more areas ~~T~~ and ~~one or more areas H~~ $T_1 - T_n$ and one or more areas $H_1 - H_m$ in a predetermined same arrangement in each area G; and

a processing part for locating the plurality of areas G in a predetermined rule.

18. (currently amended) An apparatus for embedding digital watermark information $b_1 - b_n$ ($2 \leq n$) in image data, comprising:

a processing part for dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

a processing part for defining a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S;

a processing part for allocating each of the areas S constituting each area G to some one of: areas $T_1 - T_n$ in which said digital watermark information $b_1 - b_n$, a bit value of the digital watermark information being 0 or 1, is respectively embedded, areas $J_1 - J_k$ ($1 \leq k$) in which information $p_1 - p_k$ ($1 \leq k$) specifying an embedding format for embedding said digital watermark information $b_1 - b_n$ in said areas $T_1 - T_n$, and areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded;

a processing part for locating one or more areas ~~$T_1 - T_n$, one or more areas $J_1 - J_k$, and one or more areas $H_1 - H_m$~~ $T_1 - T_n$, one or more areas $J_1 - J_k$ and one or more areas $H_1 - H_m$ in a predetermined same arrangement in each area G; and

a processing part for locating the plurality of areas G in a predetermined rule.

19. (original) The apparatus for embedding digital watermark information according to Claim 18, further comprising:

a processing part for embedding said digital watermark information $b_1 - b_n$ by increasing or decreasing pixel data values in the corresponding areas $T_1 - T_n$

according to a bit value (0, 1) of each bit of the digital watermark information $b_1 - b_n$;
and

a processing part for embedding said information $p_1 - p_k$ specifying said embedding format such that said information indicates a pattern of respective increasing/decreasing directions in the area $T_1 - T_n$ for a bit value of the digital watermark information, in each area G to which the areas $J_1 - J_k$ embedded with said information $p_1 - p_k$ belong.

20. (currently amended) The apparatus for embedding digital watermark information according to Claim 17, wherein:

each of said areas G includes a plurality of ~~said areas H that have been allocated $H_1 - H_m$ which have been predetermined in a location~~ so as to be asymmetric in vertical and horizontal directions in the area G in question.

21. (currently amended) An apparatus for extracting digital watermark information $b_1 - b_n$ ($2 \leq n$), a bit value of the digital watermark information being 0 or 1, from image data in which said digital watermark information is embedded, comprising:

a processing part for dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

a processing part for detecting areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded, from said plurality of areas S ; and

a processing part for recognizing a plurality of areas G each consisting of $P \times$

Q ($1 \leq P, Q$) of the areas S, said plurality of areas G being located on said image data, and said recognition being carried out ~~based on locations of said detected areas $H_1 - H_m$ ($1 \leq m$) on said image data~~ by comparing locations of said detected areas $H_1 - H_m$ on said image data and locations of predetermined areas $H_1 - H_m$ in the areas S.

22. (currently amended) An apparatus for extracting digital watermark information $b_1 - b_n$ ($2 \leq n$), a bit value of the digital watermark information being 0 or 1, from image data In which said digital watermark information is embedded, comprising:

a processing part dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

a processing part for detecting areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded, from said plurality of areas S;

a processing part for recognizing a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S, said plurality of areas G being located on said image data, and said recognition being carried out by comparing locations of said detected areas $H_1 - H_m$ on said image data and locations of predetermined areas $H_1 - H_m$ in the areas S ~~based on locations of said detected areas $H_1 - H_m$ ($1 \leq m$) on said image data~~; a processing part for extracting, in each of the plurality of areas G recognized, information $p_1 - p_k$ ($1 \leq k$) from areas $J_1 - J_k$ in which said information $p_1 - p_k$ ($1 \leq k$) should be embedded, said information $p_1 - p_k$ specifying an embedding format for embedding said digital watermark information $b_1 - b_n$ respectively in said areas $T_1 -$

T_n ;

a processing part for recognizing the embedding format of the digital watermark information $b_1 - b_n$ in the areas $T_1 - T_n$ in the area G in question; and

a processing part for extracting the digital watermark information $b_1 - b_n$ from the areas $T_1 - T_n$, according to the recognized embedding format.

23. (original) The apparatus for extracting digital watermark information according to Claim 22, further comprising:

a processing part for extracting, for each of the plurality of groups G recognized, the information $p_1 - p_k$ embedded in the areas $J_1 - J_k$, to recognize a pattern of increasing/decreasing directions of pixel data values for a bit value of the digital watermark information, in the area G in question, and to detect each bit value of the digital watermark information $b_1 - b_n$ embedded in the areas $T_1 - T_n$, according to the recognized pattern of increasing/decreasing directions.

24. (currently amended) The apparatus for extracting digital watermark information according to Claim 21, further comprising:

a processing part for detecting a plurality of areas H from each of the areas G; and

a processing part for comparing the detected areas H with an embedding pattern for the areas H a predetermined location in the areas $H_1 - H_m$, said predetermined location embedding pattern being determined in advance such that the areas H become asymmetric in vertical and horizontal directions in the area G in

question; and

a processing part for judging contents of image processing carried out on the image data.

25. (currently amended) An apparatus for embedding digital watermark information $b_1 - b_n$ ($2 \leq n$) in image data, comprising:

a processor; and

a storage unit for storing codes for making the processor execute a method of embedding the digital watermark information; wherein:

said codes comprises:

codes for dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

codes for defining a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S ;

codes for allocating each of the areas S constituting each area G to some one of: areas $T_1 - T_n$ in which said digital watermark information $b_1 - b_n$, a bit value of the digital watermark information being 0 or 1, is respectively embedded, areas $J_1 - J_k$, ($1 \leq k$) in which information $P_1 - P_k$ ($1 \leq k$) specifying a embedding format for embedding said digital watermark information $b_1 - b_n$ in said areas $T_1 - T_n$, and areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded;

codes for locating one or more areas T , ~~one or more areas J , and one or more areas H~~ $T_1 - T_n$, ~~one or more areas $J_1 - J_k$, and one or more areas $H_1 - H_m$~~ in a predetermined same arrangement in each area G ; and

codes for locating the plurality of areas G in a predetermined rule.

26. (currently amended) An apparatus for extracting digital watermark information $b_1 - b_n$ ($2 \leq n$), a bit value of the digital watermark information being 0 or 1, from image data in which said digital watermark information is embedded, comprising:

a processor; and

a storage unit for storing codes for making the processor execute a method of extracting the digital watermark information; wherein:

said codes comprises:

codes for dividing the image data into a plurality of areas S each consisting of $M \times N$ ($1 \leq M, N$) pixels;

codes for detecting areas $H_1 - H_m$ ($1 \leq m$) in which any of bit information 0 and 1 is not embedded, from said plurality of areas S;

codes for recognizing a plurality of areas G each consisting of $P \times Q$ ($1 \leq P, Q$) of the areas S, said plurality of areas G being located on said image data, and said recognition being carried out ~~based on locations of said detected areas $H_1 - H_m$ ($1 \leq m$) on said image data~~ by comparing locations of said detected areas $H_1 - H_m$ on said image data and locations of predetermined areas $H_1 - H_m$ in the areas S; and

codes for extracting, in each of the plurality of areas G recognized, information $p_1 - p_k$ ($1 \leq k$) from areas $J_1 - J_k$ in which said information $p_1 - p_k$ ($1 \leq k$) should be embedded, said information $p_1 - p_k$ specifying an embedding format for embedding

said digital watermark information $b_1 - b_n$ respectively in said areas $T_1 - T_n$.